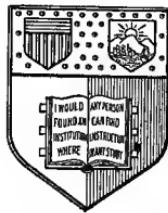


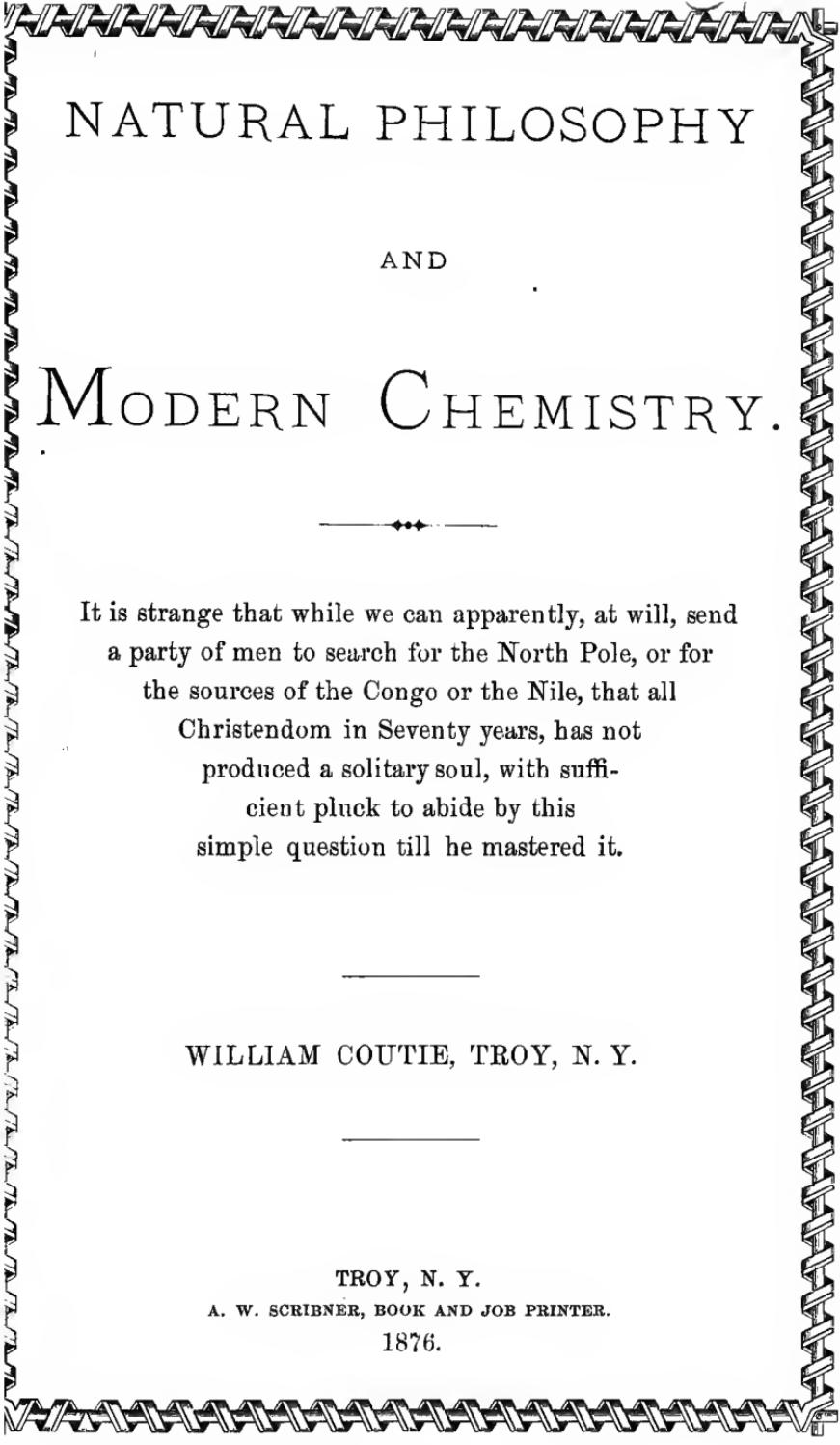
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# NATURAL PHILOSOPHY AND MODERN CHEMISTRY.

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WILLIAM COUTIE, TROY, N. Y.

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TROY, N. Y.  
A. W. SCRIBNER, BOOK AND JOB PRINTER.  
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B



# Natural Philosophy and Modern Chemistry.

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A man who has spent his life in trying to practice the precepts of Newton and Watt, finds his knowledge useless and occupation gone, when he turns his attention to Chemical Philosophy ; for in our time, Chemistry is an art without a science, so far as Philosophy is concerned. What Watt taught a century ago and Newton two centuries ago is as true now as then, and will be as universally believed a century hence as now, but the teachings of Chemistry are as local as our polities, and as changeable as the weather.

Chemistry embraces the material universe, and follows its endless variety, and from the ease with which its experiments are made and accurately observed, it has a greater number of accurately measured facts than all the other sciences put together. But the facts of Chemistry have never been arranged by any one who owned the properties which produced the Principia or Steam Engine. Nearly all our exact knowledge of Chemistry is founded on the weights of its elements or atoms, the standard weight being that of Hydrogen, and the most important that of Oxygen, and next to it that of Carbon. The weight of Hydrogen has lately been changed from 1 to 2, or to use the exact phrase, we say the Hydrogen atom is double. The weight of Oxygen also has doubled from 8 to 16, but whether the atom has doubled, or only the weight, we know not. Of the weight of Carbon less is known than of either of the others ; it is either 3, 6, 12, 24 or 48, the most reasonable is 3, and the fashionable 12 ; like the others, it has doubled or changed from 6 to 12, in this case purely from style, as no reason is claimed for ei-

ther. The general excuse for change is an attempt to make the heat of the atoms of all elements equal. As this assumption must rest on the assumption that the so called elements are true elements, it rests on an assumption which no one will father, which has no evidence, and no one believes, and therefore unworthy of refutation.

We find then that the weights assigned to the elements are changeable and uncertain, like Hydrogen and Oxygen, or merely assumed from accident or convenience like Carbon, and all calculated from uncertain and conflicting rules.

After the lapse of two centuries the Principia is the greatest essay on Natural Philosophy in our language. We all know that some of its authors' opinions were erroneous, and have hindered the development of science; but what distinguishes him, and it, from almost any other man or work, is that in it he left out his opinions, and stated only those things that are almost absolutely true. The rules of reasoning, therefore, which constitute the basis of the philosophical part of this book, we copy as actually true, and as no formal rejection has been formally accepted, as actual authority.

THE MATHEMATICAL PRINCIPLES OF NATURAL PHILOSOPHY.  
[BOOK III.]

## Rules of Reasoning in Philosophy.

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### RULE I.

We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances.

### RULE II.

Therefore to the same natural effects we must, as far as possible, assign the same causes.

### RULE III.

The qualities of bodies, which admit neither intension nor remission of degrees, and which are found to belong to all bodies within the reach of our experiments, are to be esteemed the universal qualities of all bodies whatsoever.

### RULE IV.

In experimental philosophy we are to look upon propositions collected by general induction from phenomena as accurately or very nearly true, notwithstanding any contrary hypotheses that may be imagined, till such time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions.

Old style weights of the Elements from Hydrogen to Iron. Miller's Inorganic Chemistry.

Hydrogen,	1	Nitrogen,	14
Carbon,	6	Sulphur,	16
Lithium,	7	Fluorine,	19
Glucium,	9,5	Calcium,	20
Boron,	10,9	Sodium,	23
Magnesium,	12	Titanium,	25
Aluminium,	13,5	Chromium,	26,25
Silicon,	14	Iron,	28

If we look carefully at the table we find the weights are nearly all exact multiples of the weight of Hydrogen, and that the bodies differ in nothing from water, sulphuric acid, cyanogen, ammonia, carbonic acid, marsh gas, and other compounds, whose composition is known, except it be that their composition is unknown; not one of them has the properties we ascribe to an element more prominently than ammonia, except it be that its constitution is known. If we accept therefore the first rule of reason, we can not accept them as elements; but by the second and third rules we must consider them all compounds of other bodies, and all compounds of Hydrogen; for nearly all their weights are exact multiples of that of Hydrogen; and although Hydrogen can not be compounded out of the others, it has all the properties, appearances, and uses of a manufactured article; it is one of the others. Therefore, if we except the first rule of reason, we accept only one element, and accept it as compounded out of something else; not by a passive or hypocritical assent, but as honest men do acknowledge their errors or assert their rights.

Choose ye therefore, which of these two ye will, whether the first rule of reason or the seventy elements. You can not have both, for they are irreconcileable; remember, it is the first rule of Old Mother Nature, and she will not be tampered with; if you deny it, you deny her, reject her favors, and from

you the book of nature is forever sealed ; and between you and it, you place a gulf as long as time—as broad as space,—and deeper than Milton's angel ever knew ; nor will your dignity, nor honor preserve you, for she will appoint some rustic ignoramus to call you to judgment ; for she is judge and her own executor, and with her there is no delay, no evasion, and no appeal ; your hollowness will be exposed, and your rottenness become the astonishment of all men, and the children of your wives and mothers will point the finger of scorn at your driveling indecision. I will not profane her by attempting by words to convince men who reject reason, but with those who will consider whether these rules will give us the weight of Carbon and Oxygen.

The most direct, common and important combinations of Hydrogen, Oxygen and Carbon, are Water, Carbonic Acid, and Marsh Gas ; these combine by weight

1 of Hydrogen, 8 of Oxygen forms Water ;  
8 of Oxygen, 3 of Carbon forms Carbonic Acid ;  
3 of Carbon, 1 of Hydrogen forms Marsh Gas.

And by the first rule the weights of Hydrogen, Carbon and Oxygen become 1, 3 and 8.

We know that by replacing reason with dignity, and common sense by logic, and using moonlight other results appear ; but we will not weaken our argument or disgrace ourself by trying to prove a negative, nor by calling the traffic in this trash by its English name.

It is not enough to change the name of our superstition and call it Science. No where else in the history of humane thought has so much falsehood, flattery and folly been mixed with so much truth, as Chemistry contains.

What Chemistry wants is not so much a purification as a revolution, for it is rotten to its very elements.

The terrible weapons we have borrowed will do it, if we have a living man with courage to use them ; if not our boasted civilization will speedily perish,—like those that have gone before it perish, helpless and ab-

horred before the frown of an angry God, and amidst the contempt of a disgusted world,—“ for Nature is pleased with simplicity and affects not the pomp of superfluous causes.”

Seeing that the direct application of these rules show us that our elements are compounds, and that they descend so far into minutiae as to give us certain weights for Oxygen and Carbon. We will now try how far we are able to use them in obtaining the nature and relations of Nitrogen.

By the first rule we must receive Carbon=3 as a direct compound of Hydrogen, until by the fourth rule this is made liable to exceptions; and Nitrogen=14, as a compound of two others, for this agrees with chemical experience, and also by the first rule to general experience; for before nature comes to 14 she either divides or becomes irregular and multitudinous.

By the first rule we are, until otherwise shown, to receive the elements that resemble Nitrogen as formed in part of Nitrogen or of the element that makes Nitrogen, Nitrogen; and as the weights of all of them are greater than that of Nitrogen, we are first to receive them as containing Nitrogen.

No element resembles Nitrogen more than Phosphorous: its experimental weight is 31; if it contains Nitrogen the weight of the Nitrogen is either 14 or 28, and the weight of the other element is either 17 or 3. As Phosphorous resembles Ammonia, and does not resemble Carbon, then by the first rule the constitution of Phosphorous becomes Ammonia and Nitrogen, or Nitrogen 2, Hydrogen 3 until by the fourth rule this is made liable to exceptions.

Our rules tell us that Nature is simple and happily we find an element more reliable for our purpose than Phosphorous.

Fluorine=19 can only contain one of Nitrogen, and one of something else, unless that something be Hydrogen. Take the weight of Nitrogen from that of Fluorine=19—14=5, we know of no element whose weight is 5, and if Fluorine is NH5 it ought not only

to resemble Nitrogen but much more to resemble Hydrogen, but it is the extreme opposite of this. Either then our calculation is wrong, or we have a new element thrust upon us, and this new element an Acid, and resembles Chlorine and Oxygen. We do find Fluorine classed with Chlorine but not with Oxygen; so the constitution of Chlorine ought to resemble the constitution of Fluorine more than the constitution of Oxygen. The weight of Chlorine is 35.5; take from Chlorine two of Nitrogen  $35.5 - 28 = 7.5$ . As  $7\frac{1}{2}$  is exactly  $1\frac{1}{2}$  times 5, we can not but think that truth will not hide,—and that in this case  $7\frac{1}{2}$  proves the existence of the new element more forcibly than even 5 would, and is indeed a light shining in a dark place; for since the elements are all Hydrogen, their weights are all exact multiples of the weight of Hydrogen, and any difference from this is an error either in experiment or calculation. But Chlorine is not only one of the best known elements experimentally, but its combinations are so numerous, easy, simple and reliable; we cannot except an error in experiment, but our calculations have hitherto rested on so unreliable a basis, that even the weight of Oxygen has been changed to suit the most unsubstantial whim. Replace the whim by the first rule and by experiment the weight of Chlorine becomes exact multiples of the weight of Hydrogen or  $35.5 \times 2 = 71$  and  $= 14 \times 4, + 5 \times 3$ , or  $= \text{N}4, \text{A}3$ . A, being the new or acid element so that the new element not only proves its own existence in the weight of Chlorine, but compels us against our will to give the proper weight to Chlorine. The following table will show that the weights of all the other Nitrogen elements may be compounded out of 5 and 14, and the elements themselves out of Nitrogen and this element.

Fluorine,.....	AN.....	19
Chlorine,.....	A3N4.....	71
Bromine,.....	A2N5=As A....	80
Iodine,.....	A3N8=Sb2A....	127
Arsenic,.....	AN5.....	75
Antimony,.....	AN4.....	61

Seeing that, our calculation that Fluorine is composed of Nitrogen and an Acid is verified by Chlorine, and coincides with all that we know of the other Nitrogen elements, we will enquire into the nature and relations of Oxygen, it being preeminently the Acid, the weight of Oxygen being 8; if it contains the new element the weight of its other constituent will be  $8-5=3$ , the weight of Carbon; but otherwise Oxygen is known to belong to the Carbon group, or rather Carbon, Oxygen, Boron and Silicon constitute a separate group.

Sulphur is also classed with Oxygen, but not with Carbon; leaving out then for the present Sulphur, we find that by changing the weight of Boron from 10.9 to 11, that the weights and relations of all of these elements conform in all things with our previous calculations on the Nitrogen elements and form a parallel class with them.

{	Oxygen,.....	AC.....	8
	Boron,.....	AC2.....	11
	Silicon,.....	AC3.....	14

We therefore assume that we have demonstrated the existence of an Acid forming element, and that its weight is 5. Our present object is not a review of the constitution of the Chemical elements, but a review of the relations between Natural Philosophy and Chemistry. We will now stop, lest we weaken our evidence by error, or darken it by an increase of words.

We have claimed that the rules that form the basis of the Principia, are true rules for discerning truth,—and that because the number and weights of the elements do not agree with these rules, this part of Chemistry is not true. We have applied the rules to the weights and find the weights erroneous, and the rules sufficient for correcting them. We have further found the rules not only sufficient for correction but also for advancement.

If we have used useless or improper language, it is because we believe the difficulty and defect to be more

a moral than an intellectual one; it is not that the men to whom alone I can address myself do not know but because they will not consider. They deem it more true, polite, genteel, easy, and honorable to repeat the superstition of their teachers, than to follow the laws of nature, and I can not but believe that the reversal of this will improve Chemists, advance Chemistry, and enrich, honor, and elevate the race, more than all the Chemical labors of the nineteenth century.







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